



**Faculty of Information and Communication Technology**

**SIMULATION OF WEB PERFORMANCE WITH DIFFERENT  
IP ENVIRONMENT USING PLONE SOFTWARE**

**Ahmad Fairuz Bin Ahmad**

**Master of Computer Science in Internetworking Technology**

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## BORANG PENGESAHAN STATUS THESIS

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**SIMULATION OF WEB PERFORMANCE**  
**WITH DIFFERENT IP ENVIRONMENT USING PLONE SOFTWARE**

**AHMAD FAIRUZ BIN AHMAD**

**A thesis submitted**  
**in fulfillment of the requirements for the degree of Master of Computer Science in**  
**Internetworking Technology**

**Faculty of Information and Communication Technology**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2014**

## DECLARATION

I declare that this thesis entitle "Simulation of Web Performance with Different IP Environment Using Plone Software" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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## APPROVAL

I hereby declare that I have read through this project report and in my opinion this project report is sufficient in terms of scope and quality for the award of the degree of Master of Computer Science (Internetworking Technology).

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## **DEDICATION**

This work is dedicated to my beloved family and siblings, who passed on a love of reading and respect for education. To my supportive friends and my supervisor Dr Abdul Samad Sibghatullah, thank you so much for assist and help.

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Bismillahirrahmanirrahim

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## **ABSTRACT**

The website is one of the applications that are widely used in computer networks to disseminate information to the public. Skills to access or navigate a website depends on the framework and the type of web server used and the use of Internet Protocol be applied. Internet Protocol (IP) is a network protocol that connects the main transmission between networks. Currently, Internet Protocol version 6 (IPv6) is a version of the Internet Protocol (IP) designed to replace and improve the weaknesses in the existing version of the Internet Protocol Version 4 (IPv4). This thesis will analyze the performance of Internet Protocol Version 4 (IPv4) and Internet Protocol Version 6 (IPv6) through access to websites that are developed using Plone technology as its framework (framework) in Dual Stack transition mechanisms. This testing is done in a simulation environment to get more accurate test results. Parameters chosen were response time, the size of bandwidth and the packet size to be used in a comparison test done. Based on the results and analysis in detail, the selection of Internet Protocol (IP) that will best be determined.



## ABSTRAK

Laman web merupakan salah satu aplikasi yang digunakan secara meluas di dalam rangkaian komputer untuk menyalurkan maklumat kepada umum. Kecekapan untuk mengakses atau melayari sesebuah laman web bergantung kepada rangka kerja (framework) dan juga jenis pelayan web yang digunakan serta penggunaan Internet Protokol yang di implemenkan. Internet Protocol (IP) merupakan protocol utama yang digunakan untuk menghubungkan transmisi di antara rangkaian. Kini, Internet Protocol Versi 6 (IPv6) merupakan versi Internet Protokol (IP) yang direka khas untuk menggantikan dan menambah baik kelemahan yang ada pada versi yang sedia ada iaitu Internet Protocol Versi 4 (IPv4). Tesis ini akan menganalisa prestasi bagi Internet Protocol Versi 4 dan Internet Protocol Versi 6 melalui capaian kelaman web yang dibangunkan menggunakan teknologi Plone sebagai rangka utama (framework) di dalam rangkaian Mekanisma DualStack. Ujian yang dilakukan adalah dalam keadaan persekitaran simulasi untuk mendapatkan hasil pengujian yang lebih tepat. Parameter yang dipilih adalah masa tindak balas (response time), saiz jalur lebar (bandwidth) dan saiz paket (packet size) untuk dijadikan perbandingan dalam pengujian yang dilakukan. Berdasarkan keputusan dan analisis yang dilakukan secara terperinci, pemilihan Internet Protokol (IP) yang terbaik akan ditentukan.

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## LIST OF ABBREVIATIONS

IP	-	Internet Protocol
IPv4	-	Internet Protocol Version 4
IPv6	-	Internet Protocol Version 6
TCP	-	Transmission Control Protocol
HTTP	-	Simple Mail Transfer Protocol
CPU	-	Application Programming Interface
DSTM	-	Dual Stack Transition Mechanism
RPS	-	requests per second
IANA	-	Internet Assigned Numbers Authority
IPSec	-	IP Security
IETF	-	Internet Engineering Task Force
SLAAC	-	Stateless Auto Address Configuration

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 Overview**

Chapter one of this research methodology explains the background study, problem statement, objective, scope and contribution of official web performance that is currently used in Malacca State Government. Chapter 2 will cover the literature review of the related field. Chapter 3 explains the methods used to enhancing and analyzing the web performance. Lastly, a conclusion and recommendations will be discussed in the last chapter.

The purpose to do this enhancing and analyzing web performance is to resolve the user complaint loading time when surfing the website and not meet Internet Protocol version 6 (IPv6) environments, avoid security problem and minimal cost to overcome current website. Without get the proper design and method, it is very difficult to determine and to get the best performance. There are many key type of performance testing that use in web application. Example type of performance testing such as performance test, load test, stress test and capacity test. This thesis describe about the Simulation of Web Performance with different IP Environment using Plone Software.

## 1.2 Background Study

This thesis focuses on the differences in network performance of various Internet Protocol version 4 (IPv4) and Internet Protocol version 6 (IPv6) environment used in Open Source Content Management System (CMS) Plone Framework. TCP/IP is protocol suites that allow the connection between different networks designed by different vendors into a network of networks Internet.

The population of the earth not reached 4.5 billion in 1977. ARPANET is the first Network by which one hundred and eleven interconnected computing machines make up the connection. During the period 2000-2011, internet usage has increased by 480.4%(Khan et al. 2012). Table 1.1 shows the World internet usage and population statistics website, illustrating the population of internet users and the growth from major world regions(Miniwatts Marketing Group 2013).

Table 1.1: World Internet Users and Population Statistics(Khan et al. 2012)

<b>WORLD INTERNET USAGE AND POPULATION STATISTICS</b> <b>June 30, 2012</b>						
World Regions	Population ( 2012 Est.)	Internet Users Dec. 31, 2000	Internet Users Latest Data	Penetration (% Population)	Growth 2000-2012	Users % of Table
<a href="#">Africa</a>	1,073,380,925	4,514,400	167,335,676	15.6 %	3,606.7 %	7.0 %
<a href="#">Asia</a>	3,922,066,987	114,304,000	1,076,681,059	27.5 %	841.9 %	44.8 %
<a href="#">Europe</a>	820,918,446	105,096,093	518,512,109	63.2 %	393.4 %	21.5 %
<a href="#">Middle East</a>	223,608,203	3,284,800	90,000,455	40.2 %	2,639.9 %	3.7 %
<a href="#">North America</a>	348,280,154	108,096,800	273,785,413	78.6 %	153.3 %	11.4 %
<a href="#">Latin America / Caribbean</a>	593,688,638	18,068,919	254,915,745	42.9 %	1,310.8 %	10.6 %
<a href="#">Oceania / Australia</a>	35,903,569	7,620,480	24,287,919	67.6 %	218.7 %	1.0 %
<b><a href="#">WORLD TOTAL</a></b>	<b>7,017,846,922</b>	<b>360,985,492</b>	<b>2,405,518,376</b>	<b>34.3 %</b>	<b>566.4 %</b>	<b>100.0 %</b>

This increasing happens because a usage of social networking sites on the Internet and the growing services of the internet. That because the requirements demands for the use of multimedia applications and needs higher communication speed. To address this issue, hardware developers have increased the speed of hardware such as processors, switches and routers. Developers also increased the speed of infrastructure backbones such as the capacity of the cables used. However, the maximum amounts of data that can be transferred via this media remain unchanged. The CPU workload is heavy and the processing of network protocol task is the bottleneck (Lutui 2011).

There is an issue with the existing Internet Protocol version4 (IPv4) which is running out of IP addresses. Internet Engineer Task Force has considered this issue and proposed a new version of Internet Protocol namely Internet Protocol Version 6 (IPv6). For incoming future, the current Internet Protocol version 4 (IPv4) will slowly migrate to Internet Protocol version 6 (IPv6). That's because Internet Protocol version 6 (IPv6) is the best solution to the massive growth of the Internet due to the size of the address spaces. IPv6 addressing contains 128 bits binary value that provide  $2^{128}$  addresses comparing IPv4 only 32 bits.

Obviously, performance is most important thing for the wide acceptance of Internet Protocol stack implementation. Because of that, this Simulation of Web Performance with different IP Environment using Plone Software is very important to understand and clear the impact of this area.

These projects will running using Linux Centos 6.4 trusted server network for Plone website that apply IPv4 and IPv6 dual stack mechanism, personal computer using Windows 7 that have configure IPv4 and IPv6 and tools for analyzing the performance. There are two type use to measure web performance, which is traffic (performance, load and stress), and CPU utilization in server workload. HTTP Traffic Generator for Windows 7 environment and Wireshark for Linux Centos environment are used to analyzing web performance in this project. There are two scenarios will do to analyzing the web performance in this project. First, analyzing from client using IPv4 to access Plone website server that apply IPv4 and IPv6 dual stack mechanism will be apply. Second, analyzing from client using IPv6 to access Plone website server that apply IPv4 and IPv6 dual stack mechanism will be apply.

### **1.3 Problem Statement**

Department of Information Technology in Malacca State Government is responsible to control and manage the Official Website Malacca State Government. Nowadays, there are using Joomla as a framework for this official website. By the way, there are some problem occurs and we will get complaint by users. By using Joomla at this moment, it is very complex and requires many server resources. Database should always optimize for better performance because if you add many external plug-in, chances are that the site will fail if is having lots of daily traffic. This is one of major problem occurs at this time. The other problems that we get from user complaint is response time to access the website are slow and not meet Internet Protocol version 6

(IPv6). The other problem is to avoid security issues and want to reduce cost for the current website.

Malaysian Administrative Modernization and Management Planning Unit (*MAMPU*) are responsible to monitor the entire official state website. If the website has a problem, MAMPU will give a warning to the owner of website to solve the problems occur. Because of that, we will make a decision and solution to propose this project, which is Simulation of Web Performance with different IP Environment using Plone Software.

## **1.4 Objective**

- 1.4.1 To verify problem occur in web performance testing
- 1.4.2 To propose the new method by using Plone Software to change the current which is Joomla Software.
- 1.4.3 To compare performance testing in IPv4 & IPv6 Environment by using Dual Stack Transition Mechanism
- 1.4.4 To identify the best IP Environment to overcome the current problem

## **1.5 Scope**

The scopes of this project are about Simulation of Web Performance with different IP Environment using Plone Software. The main purpose to do this project is for solves the current problem occur by using Joomla framework and make new implementation by using IPv6 environment in feature. This project is related to IPv4 and

IPv6 Dual Stack Transition Mechanism. Lastly, Plone Software is used to be implementing in Linux Centos 6.4 environment to replace the current software.

## **1.6 Project Contribution**

The major problem is web performance and security. Because of that we will choose the Plone Software and the IP Environment which is IPv4 and IPv6 by using Dual Stack Transition Mechanism for this project contribution.

### **1.6.1 PloneSoftware**

Plone is a CMS written in python, built using the Zope framework, and released under the GPL v2 license. Plone is a user friendly, powerful solution that lets you easily add and edit any type of content through the Web, produce navigation and searches for that content and apply security and workflow to that content. Plone enables you to put together almost any Web site and easily update it. Finally, probably the best things about this system are that it's free and it's open source. Table 1.2 shows the features that provide by using Plone.